Energy Probe Enquête Energie

COST-OVERUNS ON LARGE SCALE ENERGY PROJECTS:- IMPLICATIONS FOR A MACKENZIE VALLEY PIPELINE AND THE PRICE OF ENERGY.

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INTRODUCTION

The intent of this report is to estimate the likelihood, in general terms, of a large cost over-run on the proposed Mackenzie Valley gas pipeline and to draw out the implications of such an over-run for energy policy and energy prices in Canada. In arriving at our conclusions we have examined the experience of the nearly completed Alyeska oil pipeline and the Syncrude tar sands plant. With these two projects in mind we have reviewed the proposals for the Mackenzie Valley development, drawing out the similarities and common problems of large-scale energy developments.

It is our assessment that a large cost over-run during the construction of the Mackenzie Valley pipeline is virtually certain. In our view this will have serious consequences for the Canadian economy, forcing us into high cost resources at a time when more moderate prices would aid a struggling economy, and increasing our dependence on resource exploitation when strengthening of the manufacturing sector is of prime importance.

By investing the billions needed to develop frontier fuels we tie up scarce funds in a policy which works against economic diversification with stable, long term economic expansion and which favours continuance of the old policies of resource sell-out with short term, boom-bust economic growth. Billions of dollars of investment in frontier fuels also means that Canadians will face soaring energy prices, cut-backs in public services, and unnecessary delays in the implementation of renewable energy technologies. The proposed Mackenzie Valley gas pipeline is not, in our opinion, a wise investment for Canada at this time.

.....

Cost over-runs on large-scale construction projects, particularly on energy-related projects, tend to be spectacular. In the case of the trans-Alaska pipeline the ultimate cost promises to be ten times what was originally proposed. Syncrude, likewise, has experienced a significant cost over-run. The total cost has escalated to four times the initial estimate. The proposed Mackenzie Valley gas pipeline has already developed giantism. Even though construction has not yet begun the pipeline is $3 billion over initial cost estimates.

The importance of cost over-runs to energy planning is sometimes overlooked. Because the cost of the energy produced or transported is determined largely by the project's total cost, including escalations, cost over-runs directly affect energy prices. Once two or three large projects have been initiated energy policy is effectively set. If cost over-runs are in the order of 300 to 400 per cent and the resulting cost of energy is high, Canada becomes locked into a long range policy of high energy prices. Domestic resources, once developed, will be used irrespective of their relative cost, even if Canadians are required to pay substantially more than the cost of comparable imported fuels. Furthermore, the price of all energy in Canada will be determined by the cost of exploiting our frontier resources. Oil, gas, and electricity prices must rise, and rise substantially, in order to make frontier sources profitable.

Cost estimates for energy developments are more than simple engineering assessments. The first estimate is especially crucial. More than a little politics is involved. As John Helliwell explains the problem:

> "Within the present procedures for gaining approval of a pipeline proposal, there is a strong incentive to bid low in order to show viability, and to be cheaper than competing projects." (Helliwell, 16)

Based on the first cost estimate the project will be either considered or rejected. Once the project has been approved, however, "subsequent increases in costs are passed on and become part of the allowed costs of the regulated utilities at the downstream end of the pipeline." (Helliwell, 16)

Whether reasonable or outrageous once construction is underway all cost over-runs are treated as legitimate. Although, "the risks of large cost over-runs are seen

by all participants to be substantial....there is no incentive for the proponents to be more bluntly realistic in their cost estimates, and no easy way for outsiders to measure the likely size of the bias." (Helliwell, 16). Engineers who had previously sworn on a stack of bibles that the project could be built within the budget proposed, suddenly shrug off millions of dollars of cost over-runs, swearing now that they could not have been avoided. Similarly, the owning companies are free to renege on their previous estimate, nor are they required to hold the line on costs. In fact, it generally pays the owners to do just the opposite: to inflate costs and pad expenses as much as possible.

Energy policy in Canada has been predicated on the assumption that Canadians will be better off in the long run if we develop our frontier, high cost energy resources. Energy self-sufficiency appears to be the goal. But what price is self-sufficiency worth? Given the high cost of developing frontier fuels, the size of cost over-runs, and the pricing policies the companies are allowed to pursue this policy may find Canadians paying a hefty premium for the privilege of consuming our own energy resources.

A NOTE ON SOURCES

Information on cost over-runs and their causes is sketchy at best. The companies responsible are loathe to publicize their short-comings, leaving themselves open to charges of mismanagement, incompetence, or even fraud. Instead, they try to obscure the deep-rooted causes with generalities, attributing cost over-runs to "inflation" or "delays". By externalizing the causes, the companies attempt to externalize the blame so that by the time the project is completed the companies are no longer responsible for the seemingly uncontrollable cost spiral.

Even though the project managers rarely discuss cost escalations with the press, newspaper accounts and magazine articles are still the best (and virtually the only) source of information on the subject. But, since news articles are by nature piecemeal much of the truth is never uncovered. The story behind most cost over-runs remains untold.

As more and more of these massive energy developments are undertaken the significance of burgeoning cost over-runs to the price of energy will become increasingly apparent as fuel prices continue to climb. As matters stand at present, the companies - no matter how wasteful, how negligent, or how irresponsible - are off the hook, their profits are assured. This will undoubtedly remain the case as long as the real reasons for cost over-runs are hidden from public scrutiny. Until a more serious interest is taken by government officials to protect the public interest by exposing the underlying causes of cost escalations those responsible will never be made accountable. Consumers will pay high prices for essential fuels and, what is worse, they will continue to pay the companies higher and higher profits in direct proportion to the size of the cost over-runs.

CHAPTER I

ALYESKA - THE CLASSIC CASE

The Unending Cost Spiral

February, 1969 - $900 million for a 600,000 barrel a day pipeline

March, 1970 - $1.3 billion (an increase of $400 million or 44.4% over 13 months)

March, 1971 - $2.2 billion (increase of $900 million or 69.2% over one year)

March, 1972 - $2.45 billion for a 1.2 million barrel a day pipeline (and an increase of $250 million or 11%)

March, 1973 - $2.86 billion (increase of $410 million or 14.3% over one year)

Fall, 1973 - $4.5 billion (increase of $1.64 billion or 57.3% in just half a year!)

October, 1974 - $5.982 billion (increase of $1.482 billion or 32.9% in a year)

June, 1975 - $6.375 billion (increase of $393 million or 6.6% in a year and a half)

June, 1976 - $7.7 billion (increase of $1.325 billion or 20.8% in a year)

Contrary to what Alyeska would have the public believe, the stage was set for unending cost increases long before the first piece of pipe was laid. Once construction was underway engineering and logistics problems encountered in the field contributed significantly to the pipeline's total cost, but they were not the real cause of the massive cost over-runs. The reason for Alyeska's mushrooming estimates was not bad weather, poor workmanship, or even the consortium's inept management of the project, but primarily the politics of oil. This alone can explain Alyeska's willingness to allow costs to balloon without restraint and make sense of the consortium's practice of mindlessly committing more and more men and equipment to the project.

Between the time the trans-Alaska pipeline was first proposed in February of 1969 and the beginning of construction during the summer of 1974, the cost estimate had risen from $900 million to an unbelieveable $6 billion - a cost over-run of 500% before the project was even begun! These are cost over-runs that would give the Pentagon ulcers. Present projections are for a total cost of $10 billion.

Strangely, these astronomical over-runs have not jeopardized the viability of the pipeline. Normally, cost escalations of this order would kill a project as promoters watch their potential profits evaporate with rising costs. Yet, ultimate profitability of the Alyeska pipeline has never really been in doubt. Analysts of L.F. Rothschild & Co. in New York have reassured their clients about the ultimate profitability of the venture.

"Profits to the operating companies could be limited in 1977 but should be substantial in 1978.

....

"Based on production of 1,500,000 b/d and a selling price of $11.00/barrel, our calculations indicate an annual profit potential of $600 million from the pipeline and $1.2 million from the production, a total return of 18% on the estimated $10 billion initial investment..."

Politics and Oil

Had the companies put forward their pipeline proposal with a price tag of $10 billion attached in 1969 they would have been laughed out of Washington. But many things have changed since 1969, principally the value of a barrel of oil.

The price of oil is the determining factor in assessing the viability of the pipeline. Oil from the North Slope would have been uneconomic in 1969 unless it could have been marketed in the south at a price comparable to conventional crude - at that time about $3 a barrel. This would have been conceivable with a pipeline costing $900 million, but a ludicrous proposition with a pipeline costing ten times that. At $10 billion the transportation costs alone are in the neighbourhood of $5 a barrel. (Comptroller General, 32)

North Slope oil delivered via the trans-Alaska pipeline will be competitive in the lower 48 states when it comes on-stream this year only because the price of oil has jumped from $3 to more than $11 a barrel in the intervening eight years. Had the so-called energy crisis not intervened a $10 billion pipeline would be abandoned.

Alyeska's pipeline prospects remained dim during 1970 and 1971 while the consortium continued to fight off the objections of the environmental movement in the U.S. The pipeline's saving grace was the energy crisis. Enormous increases in the price of oil were easily justified to the public in the face of immediate shortages and diminishing world reserves. And, since high prices satisfy both the industry and OPEC it is unlikely that the cost of oil will fall appreciably in the near future. Furthermore, the announced intention of the American government to seek energy self-sufficiency will require the development of non-conventional, high cost resources which can be profitably exploited only at prices substantially higher than those of the sixties.

In fact, oil prices are protected from the market forces of supply and demand. The value of a barrel of oil is now determined by Congress.

This is the clue to Alyeska's cavalier attitude towards spiralling pipeline costs - all the while passing them off as the inevitable consequences of building a pipeline in the arctic. The price of a barrel of "new" oil has been set at $11.28, plus an adjustment for inflation. North Slope oil is entitled to a further 3 per cent

and the Federal Energy Administration is empowered to establish a special price for arctic oil (subject to congressional veto).

Once the pipeline is operating each of the eight companies involved in Alyeska will apply to the Interstate Commerce Commission to set a tariff. The tariff will be based on the total cost of the pipeline, cost over-runs and all, plus a "reasonable rate of return" on money invested. (Alyeska will function only as the operator of the pipeline on behalf of the owner companies.)

When the FEA establishes its special price for arctic oil it will include the pipeline tariff and add to that a "reasonable rate of return" for the production of the oil.

In this way the companies, principally Standard of Ohio, British Petroleum, Atlantic Richfield, and Exxon, profit twice: once as participants in the pipeline consortium and a second time as the producers of North Slope oil.

Indeed, because the tariff established will incorporate the total cost of building the pipeline and oil prices will be set with this tariff in mind, the companies profit more by spending. Moreover, each of the companies in Alyeska is entitled to a dollar for dollar credit against its taxes for the billions spent on the pipeline. Interest paid to borrow this money is also tax deductible.

These are, as one observer notes, "compelling incentives to build the line quickly and equally compelling incentives not to worry about costs". (Gruenstein)

In 1969 with oil selling at $3 a barrel it was in the companies' interest to minimize pipeline costs so that North Slope oil could be marketed at competitive prices. Today, eight years and one oil crisis later, prices are set to accommodate the companies. Inflated pipeline costs mean inflated profits. In the words of one long-time pipeline worker, "The more you spend, the more you make.(Alyeska) wants to be ripped off." (Gruenstein)

The price of oil produced by Syncrude and the price of gas transported through the Mackenzie Valley pipeline will be similarly dependent upon the total construction

costs of the projects, including cost over-runs. The companies are virtually invited to force up energy prices, and consequently their own profits, by spending as much as they can on construction. Thus will future energy prices in Canada be determined.

Bad Planning and Lack of Foresight

Despite Alyeska's protestations that all the cost escalations incurred between 1969 and the commencement of construction were the result of three things: increased material costs, increased labour costs, and a more sophisticated design and engineering (Comptroller General, 13) and that all subsequent cost over-runs were unavoidable complications resulting from the construction of a pipeline in the arctic, much of the continuing cost spiral was the result of bad planning. In a project of this magnitude where "logistics alone appear to be virtually unmanageable" (Comptroller General, 3) detailed planning is essential and could have at least minimized the extent of the somewhat inevitable cost escalation.

From the start the project reflected a lack of overall co-ordination of engineering, design, research, and logistics problems. The consortium was always in a hurry, putting forward a proposal that had not been fully developed, that could not be substantiated with hard research data, and pressing for quick government approval to meet Alyeska's own, internally imposed, deadlines.

The Alaska Pipeline Co-ordinator's Office published a report in February, 1975 analyzing the repeated delays during the construction phase. At page 10, the report notes:

> "Alyeska's overly optimistic planning and scheduling, or lack of foresight, is most noted by field and office personnel who are constantly pressed to process and issue notices to proceed. The justification for haste has nearly always been that the execution contractor is on the site and ready to begin operations.....once the notice to proceed has finally been issued, Alyeska's execution contractors have not been in position to perform the work covered." (Champion)

Slipshod planning and lack of foresight have been the two most notable features

of the pipeline project from its inception. The initial proposal to bury a hot-oil pipeline 800 miles, much of it through permafrost, shows nothing if not the consortium's lack of foresight and unwillingness to be bothered with basic research into arctic conditions. This proposal, which "posed innumerable questions - environmental, technical, and economic - to which no one had any answers" (Champion, 102) was presented to the Interior Department in June of 1969. The companies expected approval by July, 1st.

Planning in 1969 was virtually non-existent. In her book The Alaska Pipeline Mary Clay Berry remarks, "The initial feasibility studies for the pipeline consisted mostly of flying over Alaska in airplanes." (103) Nor did the companies seem eager to go out and get the necessary information when the deficiencies of the original application were pointed out.

A task force within the Interior Department reported in September, 1969 that the consortium had not offered any solutions to the problems of building a northern pipeline. They had not, for example, demonstrated that a hot-oil pipeline could be safely buried in the permafrost (most arctic experts said it could not), they has not come up with sources for the enormous quantities of gravel which the project would require, they had not explained how the integrity of the pipeline could be ensured over the earthquake zones, they had not solved the problem of the disposal of human waste or the prevention of water pollution from the inevitable oil spills, nor had they studied the possible effects of so much human activity on the Alaskan wildlife. In spite of these gaping holes in the proposal, however, the Interior Department made it quite clear that it was prepared to give approval to the project "on the theory that TAPS would provide the necessary technical information if prodded sufficiently." (Berry, 110)

Not taking the hint seriously, the companies continued to assure the public that the pipeline could be built safely. "It will take a great deal of care and a great deal of money," they warned, "but we know we can build the pipeline without significant damage to the land or to the wildlife." (Berry) The companies were confident but when questioned for details could never seem to justify their confidence.

TAPS was eager to begin construction of the Valdez to Fairbanks section of the line in March, 1970. They had not, however, solved the problem of the unstable permafrost in the Copper River Valley. "TAPS insisted it could bury the pipe there but could not tell the Geological Survey how it could do it safely." (Berry, 113)

In assessing the consortium's plans William Pecora of the U.S. Geological Survey reported in a memorandum to the Secretary of the Interior in 1970 that "TAPS has not demonstrated acceptable fundamental design criteria for below-ground construction in permafrost of a hot-oil pipeline that would be reasonably safe from failure." (Berry, 121)

Construction of the pipeline was delayed for four years by a series of court injunctions obtained by the environmentalist movement. Alaskans, although vociferously unhappy about these obstacles, may have unwittingly been saved from an ecological disaster of magnificent proportions.

During these years of court proceedings Alyeska did basic research into the arctic environment. They drilled 4000 boreholes to examine the soil conditions along the route applying this knowledge to a fundamental redesign of the pipeline. Alyeska, however, never did adopt a finalized design. Furthermore, numerous doubts remain about the thoroughness of the consortium's environmental research.

In spite of its 4000 boreholes Alyeska's lack of knowledge about northern conditions and its dearth of arctic engineering practices remained profound. Charles Champion in his report referred to the "initial lack of fundamental knowledge of oil industry construction techniques in arctic and subarctic environs by both industry and government...." He went on to explain "Alyeska as well as State and Federal reviewing agencies had limited knowledge of the arctic and subarctic regions to be traversed by the pipeline. Baseline data was essentially non-existent." (2, 3) Elsewhere he noted: "Alyeska and its contractors were in many ways not prepared to deal with Alaska's harsh environment. Adequate preplanning has not always been apparent." (4) And, "Alyeska had virtually no prior construction experience in arctic and subarctic environs." (8)

Finally, having reviewed Alyeska's wildlife research Champion judged it to have been "too limited in time and scope." (29)

Design - Or the Lack of One

News reports of the pipeline's progress substantiate the claim that Alyeska never did adopt a complete and finalized design for the project. Construction industry experts knowledgeable about the Alaskan pipeline report, in a similar vein, that Alyeska was continually redesigning the pipeline as it was being built. Redesign is an expensive undertaking before the commencement of construction, but becomes extravagantly expensive once construction is underway, involving delays, idle men, and idle equipment. Nor is designing a project in the field a reliable way to construct a pipeline.

Evidence of Alyeska's lack of comprehensive design and engineering specifications has been taken from journalistic accounts of the construction phase. Alyeska does not willingly admit to its lack of foresight and preparation.

*Before the passage of the National Environmental Protection Act in 1970 Alyeska intended to begin construction on a buried hot-oil pipeline immediately. The consortium had not planned to undertake further feasibility or environmental impact studies. Subsequently, however, Alyeska was forced to modify its proposal in light of the NEPA and perform certain research work required by the Act.

In its March, 1971 updated cost estimate the consortium costed the design and engineering changes required by the initial draft regulations for protecting the environment at $400 million.

*When construction was finally begun in the summer of 1974 the design called for 400 miles of elevated pipe. Two years later this had increased to 425 miles, having the interesting side effect of lengthening the pipeline by 5 miles. Alyeska reported that "the changes occur because of the discovery at the time of construction that the ground characteristics such as high water content, preclude burial of pipe." - meaning that Alyeska's research had not uncovered these ground conditions early enough to incorporate them into the design. (Oil and Gas Journal, 7.6.76)

*In the early summer of 1974, just as Alyeska was gearing up for the start of construction, Atlantic Richfield announced its desire to have the initial operating capacity of the pipeline doubled from 600,000 barrels-a-day to 1.2 million barrels-a-day. Arco claimed the augmented start-up volume of the line would not involve additional cost, explaining that the change would simply mean advancing Alyeska's work schedule by a few months. Compressing the schedule meant revising the logistics of the operation to accommodate the extra men and equipment which would be needed to complete on time. (WSJ 15.7.74)

*The Alaska Pipeline Co-ordintaor's report in early 1975 explained that much of the delay involved in the regulatory procedure was the result of Alyeska changing its design plans at the last minute. "Much of the time...has elapsed while waiting for needed support information from Alyeska....the NTP's (notice to proceed with construction) must often be amended after they are issued as a result of (1) new or changing observations of field conditions resulting from additional field investigations, (2) errors or changes in the original design,....(5) lack of advance planning." (Champion, 17)

While these problems reflect an overall lack of preparedness on Alyeska's part some last minute design and engineering changes are inevitable. Champion is of the opinion that "field design changes will be required as the project continues because of unexpected foundation conditions."

*Concluding this report with a section entitled "Thought for the Future" the Alaska Pipeline Co-ordinator said, "Basic criteria and design acceptance will soon be completed..." That means that basic design of the pipeline had not been completed as of February, 1975 - almost a year into the construction phase of the project. (Champion, 38)

*Costly delays were involved in building the pumping stations because excavations showed unstable permafrost in some locations which was "not noted in earlier tests". Redesign of the ground supports was required. Eventually, 100,000 yards of permafrost was replaced with competent rack and refrigerator coils were installed beneath the foundations to maintain the proper ground temperature. Once again Alyeska's pre-construction research had failed to turn up a potential complication. (Oil & Gas J 7.6.76)

*Alyeska jubilantly announced in June, 1976 that "design work is virtually finished" on the Valdez terminal - less than a year before its scheduled completion. (Oil & Gas J 7.6.76) At that time the terminal was 50 per cent completed, almost a month behind time, and "on a very tight schedule". (WSJ 20.7.76)

*A revised cost estimate in July, 1976 increased Alyeska's total cost by $700 million to $7.7 billion. Recent design changes were part of the increased cost. Said Alyeska, "This forecast also incorporates some contingency allowances based on the extrapolation of cost trends experienced in scope and design changes over the past year." Further design changes were obviously anticipated. (WSJ 1.7.76)

*Costs were increased and engineering difficulties were unavoidable because of the special construction techniques required in Alaska. For example, temperature variations along the route range from a low of -80°F to a high of 90°F in the summer. Much of the route traverses permafrost. And the pipeline has been laid across an earthquake zone.

While complications were inevitable much of Alyeska's cost over-run and delay problem has been attributed to the unconventional design of the pipeline and the use of untested equipment.

The Champion report notes "that certain trial and error procedures are inherent in the project because of the unique environment in which the construction will take place." (6) "New technologies had to be developed and older more established techniques had to be upgraded." (9) The newness of it all unquestionably contributed to delays. Furthermore, "right-of-way construction was significantly delayed in many instances due to a lack of understanding of arctic engineering principles..." (22)

*Alyeska had difficulty installing the vertical support members for the elevated pipe because its drilling equipment was "new and untried". (Oil & Gas J 7.6.76)

*Keeping the technology as simple as possible is essential in a hostile environment such as the arctic where almost no heavy construction has occurred before. Oil Week,

in reporting the comments of Foothills' vice-president, said, "Cost overruns must be anticipated on all projects, by comparison with the experience on the Alyeska oil pipeline, Mirosh cautioned, but considered the Foothills proposal least susceptible because of a conservative approach in design and construction." All equipment and parts not previously manufactured, Mirosh said, "must be considered as prototypes and will require significant periods of debugging and field trials before they could be used reliably in such a design." (Oil Week 17.1.77)

*Arlon Tussing, an Alaskan economist very familiar with the pipeline project, says: "New technology, unfamiliar environments, and a large scale - relative to previous projects, are exactly the ingredients of the most spectacular cost overruns."

He continues: "Experience in North America with big, custom-engineered construction projects has been that they normally cost two or three times their original projections, even including an allowance for inflation. Cost estimators are like accountants in that they prefer a solid, empirically based figure to a realistic figure. They do attempt to project the increase in anticipated labour rates and in the prices of specific materials but they don't take into account the fact that huge projects, particularly if they involve new technology or a remote construction site, usually don't work the first time around, nor that both the purchaser and the licensing authorities change their minds several times in the course of planning and construction."
...
"The Alaska oil pipeline was initially estimated at something less than one billion dollars in 1969. It will finally come in at a cost between eight and ten billion. This particular project is an especially horrible example because it suffered from each of the diseases I mentioned. But it isn't unique." (CARC Newsletter Vol 4, No. 4, 1976)

Mismanagement

The cost-plus contract basis on which the pipeline is being built is open to many abuses. Alyeska itself is the prime beneficiary of the system. The tariff schedule to be established by the Interstate Commerce Commission is the ideal cost-plus arrangement. The tariff will cover whatever the ultimate cost of the pipeline is, no matter how preposterous, plus a percentage - "fair rate of return" - to Alyeska on its investment.

The actual construction of the pipeline is not being done by Alyeska. The consortium

is little more than a cardboard company. The real work has been contracted out to five contracting construction firms who in turn subcontract out parts of their work. Each of the construction firms involved in the contracting and subcontracting is working on a cost-plus basis.

Because Alyeska will not be forced to accept the financial consequences of the massive cost over-runs and its profit margin is ensured no matter what the total cost, the consortium has no real interest in keeping costs down, in checking up on its subcontractors, or in policing their spending practices. In fact, because the tariff is structured as it is, the contractors are doing Alyeska a big favour by inflating their costs. The tariff incorporates a percentage profit margin which has allowed the oil companies involved in the consortium to watch their dollar profits increase handsomely as the cost of the pipeline has inflated from $900 million to over $7 billion.

With this attitude adopted by the highest level of Alyeska's management - their chief of construction referred to it as the "gold plating" attitude - it would be unreasonable to expect the contractors and subcontractors to exercise restraint, particularly since they benefit from the same kind of profit inflation as Alyeska does.

Initially, Alyeska hired Bechtel, a giant California based construction firm to oversee and manage construction of the entire project. For reasons not completely explained, Bechtel was fired in May of 1975. Alyeska then took over the direct management of the project itself. The curious aspect of this change-over is that Alyeska, a temporary corporate front for the oil companies, has had no experience whatsoever in any kind of construction work.

Presumably Alyeska was worried that Bechtel would not be able to bring the pipeline into operation on time since the Alaska Pipeline Co-ordinator stated in his report that one problem causing delay was the project's management. "From our observations," he reported, "it is apparent that Alyeska must tighten its management control over its prime and subcontractors." (Champion, 39)

Whatever the cause, Alyeska announced that Bechtel would no longer be the construction management contractor but had been demoted to the construction technical services contractor. Alyeska assumed all the direct management functions previously performed by Bechtel. These included contract administration, field engineering, and supervision of support services (safety, labour relations, medical services, communications, camp operation).

From all accounts Alyeska has managed the project little, if any, better than did Bechtel. Engineering problems and delays have continued to plague the pipeline. Observers are critical of Alyeska's seeming indifference to cost control, their tolerance of theft and gambling in the camps, and their inept, isolated management personnel. Alyeska suffered another blow to its public image with the uncovering of thousands of faulty welds and the discovery that faked x-ray reports had been filed. Alyeska blames Bechtel; Bechtel blames Alyeska.

One article in the Washington Monthly severely criticizes Alyeska's performance as project management. The author took Alyeska to task for its "top-heavy" and "isolated" management. The top brass, he says, stay in Anchorage "hundreds of miles from pipeline operations, rather than in frigid, dreary Fairbanks". Management have been "slow to identify inefficiencies and even slower to take remedial steps". Mismanggement, he claims has been the rule.

To support his indictment of Alyeska, Peter Gruenstein charges:
*Alyeska, its five prime contractors, and host of subcontractors have all adopted "a cavalier attitude towards costs", e.g. after spending $10 million on 12 Radmark machines for backfilling the buried pipe Alyeska discovered they were the wrong type and left them sitting idle.
*theft of company property amounting to millions of dollars has been widespread, virtually uncontrolled, and winked at by Alyeska.
*an Alyeska official admits that items worth less than $500 were not even inventoried.
*warehouse, supply depots, and storage areas were left unguarded.
*labour productivity is abysmally low and declining - says one pipeline worker: "The biggest rip-off is doing no work."

Alyeska's response to these charges, amounting to gross inefficiency if not criminal

negligence, has been confident. Not the case, an Alyeska executive insists. In fact he claimed, "The last time we attempted to quantify it, we had less than half-million dollars lost on the whole project....I'm satisfied it's more difficult to steal from this project than ordinary construction projects, and our loss ratio is something less than one-tenth of a per cent..." (Gruenstein)

Inflation

In reporting its updated cost figures for the trans-Alaska pipeline Alyeska placed much of the blame for its spiralling cost over-runs on the general rate of inflation in the economy, particularly the rate of increase in the cost of labour and equipment.

There is no doubt that the spectacular rate of inflation since 1969 has affected the cost of building the pipeline. In a November, 1975 article Fortune reported that numerous companies had called off expansion programmes when the estimated cost of the new facilities multiplied by three, four, and five times over a period of two or three years. "Such hyperinflation," Fortune warned, "makes sheer guesswork of forecasts of the nation's future capital needs."

The survey was conducted amongst companies in the primary sector of the economy. Included were predominantly capital-intensive industries such as iron and steel, chemicals, and electric utilities. One example of an energy producing project postponed because of increasing costs involved Atlantic Richfield. As one of the partners in a joint venture to build the first shale-oil plant in the United States Arco decided to call a halt "when the estimated construction cost leaped threefold to $750 million in three years". The reasons for such hyperinflation are many:- "The most powerful inflationary propellant by far has been the sktrocketing cost of hardware", primarily because in basic industry, machinery and equipment comprise 60 per cent of total project costs. Booming economic conditions during the early seventies put excessive demand on available capital goods with the result that "everything has gone way up". (Fortune)

Similarly, engineering costs have been an important ingredient in rising costs. Engineering firms, "deluged" with orders during the peak of the investment boom, sharply increased their fees.

Tougher environmental and anti-pollution standards are also blamed for adding unwanted costs to new facilities. Rising interest rates coupled with capital requirements two and three times earlier estimates have jacked up the interest burden of borrowed money particularly during the construction phase of the project.

Wages have been a less serious inflationary factor. "In the last couple of years its materials and equipment that have murdered us," says a DuPont engineer. Increases in construction wages were substantial during the late 1960's but have trailed off considerably in recent years. Wages for non-supervisory field labour represent only a quarter of total construction costs on these capital-intensive projects. Wages have, says Fortune, "generally increased less than other items."

Alyeska's claim that the high rate of inflation explains much of the cost over-run experienced by the consortium is not completely credible. An index of American pipeline construction costs published by the Oil and Gas Journal shows a rise of 80 per cent between 1969 and 1975. (The index for 1969 was 191; for 1975 it was 343).

From a table entitled "Pipeline equipment-cost index (1947-100)" it is possible to determine the major components of the overall increase. In the five years between 1970 and 1975 the cost of line pipe jumped a spectacular 111 per cent. The cost of pipeline construction increased 63 per cent while the cost of pipe coating remained stable. The increase in the cost of the components of pumping equipment ranged from a low of 36 per cent for electric starters and switchgear to a high of 63 per cent for foundations. The median increase was just over 50 per cent.

The index includes no indicator for wage costs.

Since this index is primarily an index reflecting the cost of building pipelines under less extreme conditions than prevail in the arctic it can be assumed that the cost increases encountered in Alaska would be greater for equipment and for labour. It is difficult to believe, however, that the differences could be substantial enough to account for an increase in cost from the 1969 figure of $900 million to the 1975 estimate of $6.4 billion.

Even supposing that the cost of everything increased five times as fast in Alaska as it did in the lower 48 states during that period, the final cost of the pipeline would have increased from $900 million to about $4 billion - no where near the actual increase in costs.

Using inflation to explain the 600 per cent cost over-runs experienced by Alyeska simply does not work (to the extent the consortium would have us believe).

It Pays Not to Delay

Despite massive cost over-runs and accompanying horror stories of mismanagement, the pipeline will be completed on schedule. The first oil is destined to flow through the pipeline on July 1, 1977. The start-up date has not changed since Alyeska began construction back in 1974.

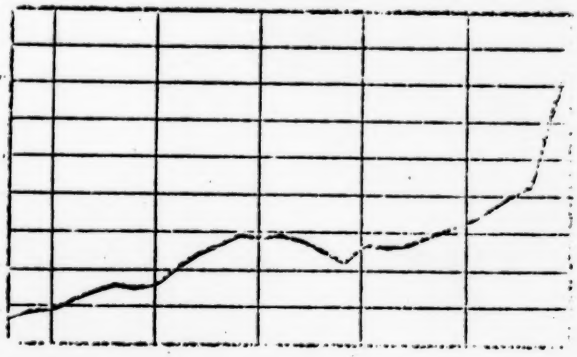
In 1974 it was important to get the oil flowing as quickly as possible. Memories of the energy crisis and the oil embargo were fresh in every congressman's mind and the public was intimidated by the prospect of having their oil supply turned off and on according to the political ups and downs in the Middle East.

In 1977 the rush to complete the pipeline on schedule is not so easy to understand. Even oil executives admit that once the arctic oil comes on-stream they won't know what to do with it all. Half the daily pipeline capacity of 1.2 million barrels is likely to be surplus to America's immediate needs. The oil industry wants permission to sell the excess to Japan, but Congress is loathe to let them. Consequently, there may be an enormous glut on the west coast with northern oil acting as a drag on the market.

The truth is that the industry goofed, or miscalculated, or misled Americans in 1974 when it stampeded the public into endorsing the pipeline.

It is common knowledge that there is no oil shortage in California where North Slope oil will end up. In fact, it is quite possible that arctic oil won't even be competitive on the west coast.

Relative cost of U.S. pipeline construction, 1948-75



Years	Index numbers	Years	Index numbers
1948	117	1963	175
1949	122	1964	183
1950	129	1965	175
1951	135	1966	179
1952	140	1967	181
1953	147	1968	187
1954	146	1969	191
1955	149	1970	176
1956	162	1971	211
1957	175	1972	221
1958	179	1973	235
1959	182	1974	279
1960	182	1975	343
1961	182		
1962	180		

Pipeline equipment-cost index (1947-100)

Pipe: Item	1956	1957	1958	1959	1960	1970	1971	1972	1973	1974	1975
1. Line pipe	180	203	220	210	206	209	225	229	245	316	440
2. Freight	150	150	156	151	128	150	180	188	188	215	245
3. Line-pipe fittings	135	189	207	197	194	208	215	213	235	269	309
Construction:											
4. Pipeline construction	125	152	152	140	168	206	227	245	285	295	335
5. Pipe coating	110	130	120	100	100	150	103	100	103	130	160
Buildings:											
6. Brick or concrete	175	205	222	235	222	245	221	256	290	293	297
7. Metal or asbestos clad (S.F.)	163	190	207	218	136	213	231	234	264	276	292
8. Frame or metal clad (W.F.)	140	155	163	173	176	159	176	184	196	210	219
9. Station grounds	102	170	135	190	193	215	155	164	195	240	319
Pumping equipment:											
10. Stationary engines recip. pumps, and speed increasers	150	185	195	200	211	215	252	262	273	324	370
11. Elec. motors (100 hp and up) and large centrifugal pump	160	207	181	154	193	201	206	200	316	344	365
12. Portable and miscellaneous units	150	150	193	159	148	225	231	230	251	280	355
13. Foundations, large units	150	150	190	191	204	240	272	289	305	335	405
14. Electric starters and switchgear	150	220	235	224	248	257	287	299	312	344	380
Machine tools:											
15. Shop machinery and tools	130	140	149	155	161	173	184	188	192	210	260
Other station equipment:											
16. Oil pipe and fittings in place	139	176	180	173	181	203	221	232	250	293	372
17. Service pipe and fittings in place	139	176	180	173	181	203	221	232	250	293	372
18. Electric equipment and wiring	150	220	235	224	248	257	287	299	312	344	380
Tanks:											
19. Oil tanks	154	193	193	195	194	253	275	294	300	362	410
Delivery facilities:											
20. Oil pipe and fittings in place	139	176	180	173	181	203	221	232	250	293	372
21. Loading racks	148	190	207	218	230	249	258	271	294	315	340
22. Railroad tracks	158	193	218	205	213	228	228	228	233	235	310
23. Docks, timber	145	155	159	178	138	202	137	196	200	227	213
24. Docks, concrete, steel	165	190	207	218	222	244	220	235	238	289	296
Communication systems:											
25. Tel. and tel. lines complete	146	162	172	172	179	192	204	224	240	265	290
26. Radio and microwave equipment	125	145	168	164	170	182	183	178	176	190	197
27. Radio tower		190	207	218	230	249	258	273	296	320	346
Vehicles:											
28. Autos, tractors, trucks	142	150	155	161	161	179	185	190	190	200	225

Source: Bureau of Accounts, I.C.C.

An appraisal of the California market by Frank Meyer & Fox, security analysts based in Los Angeles, predicts that the currently foreseen profit margin of $2 to $3 a barrel for North Slope crude priced at $13 a barrel could slump to less than $2 if the market is depressed by large surpluses. Their own estimate is for surpluses as high as 761,000 barrels a day when the pipeline is operating at 1.2 million barrels a day throughput and 1.4 million barrels when the pipeline's daily capacity is upped to 1.8 million barrels.

California oil, they point out, has a per barrel profit ranging between $3.31 and $4.05.

Alternatively, the companies may decide to market their oil inland where the oil shortage is more acute. However, Frank Meyer & Fox hasten to add, shipping the oil by existing pipelines will tack on an extra $1 a barrel to the price and another $1.50 to $2.00 if transported by tanker through the Panama Canal. All in all, the prospects for cheap oil in the mid-west are dim. By their calculations North Slope oil would have to sell at $14 a barrel for the companies to make a modest $2 profit. (WSJ 7.10.76)

The question arises then, why all the rush, particularly since Alyeska has incurred substantial cost over-runs simply to meet a seemingly inflexible start-up date.

Consider the following facts:

*First, when Arco suggested publicly that the start-up capacity of the pipeline be doubled Alyeska was allowed no more time to build the expanded 1.2 million barrel-a-day line that it had previously been allowed for the 600,000 barrel-a-day version. At the time, July, 1974, Alyeska announced that "the pipeline ooncern's instructions from the oil companies are to complete the expanded initial capacity of the line by mid-1977". (WSJ 17.7.74)

*Second, because early completion of the pipeline was considered to be in the public interest a little known 1950 law was invoked to help Alyeska meet the deadline. The pipeline was classified as a defence-related project which would

be needed in a "war-related emergency". As such Alyeska was given priority claim to scarce materials. Approximately 3 per cent of the total materials required were then in short supply. (WSJ 24.9.74)

*Third, the report of the Alaska Pipeline Co-ordinator (February, 1975) judged that "Alyeska's planning and scheduling often appear to be unrealistically optimistic...." (Champion, 5) and predicted that, given the project's current problems, start-up would be delayed anywhere from three to twelve months.

Possible delays in the start-up of the line are of considerable importance to the state of Alaska. The Champion report put the cost of a year's delay at half a billion dollars.

Six months later with delays still a problem, the assistant director for the Pipeline Co-ordinator's Office suggested that the pipeline could come in on schedule if Alyeska were to spend more money and increase manpower. "There's not much slack in their schedule," he said, "so it's going to be tight. Problems keep arising, and they are not as far along in some sections as they are in others, but so far it looks as if they may be able to make it - although it may cost more money. If they fall behind, they can add more men and more money if they want to fill the gaps." (Globe 16.10.75)

This is precisely the trap into which Alyeska fell. More money, more manpower, and more equipment were continually applied as a panacea for all construction problems.

*Fourth, an updated cost estimate of the pipeline increasing the total cost from $5.98 to $6.38 billion in mid-1975 cited as one of the reasons for the over-run the necessary compression of the work schedule to meet the mid-1977 start-up date.

*Fifth, the Wall Street Journal reported in August, 1976 that Kuhn Loeb & Co., stock analysts, predicted a delay of up to one year. "If so," they said, "a substantial overrun above the present budget seems unavoidable." An extra billion dollars was

their forecast of the additional interest costs which would be incurred in delaying start-up for a year. (WSJ 11.8.76)

*Sixth, in September, 1976 a report on the pipeline by the Subcommittee on Energy and Power of the House of Representatives concluded that "the amount of work remaining to be done leaves us with serious doubts about whether the summer of 1977 is a realistic date by which to expect the line to be operational." They commented that, in their opinion, Alyeska's time squeeze was serious since the consortium had "kept the most difficult part until last." WSJ 13.9.76)

*Seventh, the Subcommittee reported that after reviewing Alyeska"s performance all the major problems which had confronted the companies in 1975 were still visible in 1976, despite statements to the contrary by officials of the Department of Transportation. The problems included: inadequate quality control, radiographers falling behind the work crews, insufficient number of x-ray crews, failure of government inspectors to keep pace with the pipeline's progress; pipe not buried below the ground to the minimum acceptable depth. Furthermore, the Subcommittee pointed to the environmental problems plaguing the construction phase - erosion, excessive number of oil spills, and faulty leak detection.

These problems, the Subcommittee decided, resulted from "Alyeska's desire to complete a 4-year project in 3 years..." (WSJ 13.9.76)

*Eighth cost control became impossible to impose as manpower and equipment were poured into the project to guarantee timely completion.

In a letter from Alyeska's chief of construction to Bechtel's Alaska general manager in December, 1974, Frank Moolin refers to what he calls "an atttitude of 'gold plating'". "This attitude," he writes, "manifests itself in 'slugging' the project with people, facilities, equipment, etc....The aura of 'only the best is good enough' must be dispelled by Alyeska and Bechtel management...If the 'gold plating' attitude is not wiped out....WE WILL NEVER BE ABLE to exercise cost control. It will get away from us and be too late." (emphasis in the original (Gruenstein)

As the history of cost over-runs shows, cost control was never seriously implemented and the escalations quickly got out of hand. (Gruenstein)

*Ninth, the trade off between cost escalations and speed-up of construction to meet deadlines is a direct one. The additional men and equipment that were constantly being added to the project to make up for lost time were hired at premium rates in Alaska.

It costs an estimated $40 to $50 a day to feed and house each construction worker.

In explaining another upward revision in costs in July, 1976 Alyeska announced that part of the added $700 million was the result of bringing in extra construction materials and equipment, including the freight charges involved.

*Tenth, Alyeska's response to any slow-down or construction difficulty is to throw in more manpower. The consortium announced in November, 1976 that to ensure the start-up date of July, 1977 they were hiring on more workers. (Oil Week 29.11.76)

More and more manpower has had a perverse result. Labour productivity has steadily fallen over the lifetime of the project. Stories abound of pipeliners being paid exhorbitant sums for performing little or no work. And, what is more important, this practice has been condonned by management.

Revised manpower estimates made in 1974 forecast peak employment at 16,000 during the summer of 1975, falling off to 12,000 the following summer. "But," observes one critic, "labour productivity has continued to fall far below even these revised estimates; the Alyeska solution has been to throw in more manpower." Employment on the pipeline topped 21,000 during both summers. "At a conservative estimate of $75,000 per man-year - including pay, food, lodging and equipment = that's an additional $1 billion in costs right there." (Gruenstein) The only conclusion possible is that, for Alyeska, meeting its own internally determined deadline has been extremely expensive. The puzzling aspect is why the consortium has kept itself

so stringently to its original time frame. There is no crying need for arctic oil in the south, particularly oil which has every prospect of being more expensive than current supplies.

A now obvious part of the explanation is the neat profit package awaiting the companies when the pipeline starts up. As long as the oil sits in the ground it is worthless to the companies, but once it starts flowing they are assured of a profit.

But there is an added twist of corporate politics in this story.

The largest holder of proven reserves on the North Slope is British Petroleum with 5.3 billion barrels (out of a total 10 billion). BP is a British based multi-national oil company with world-wide reserves but limited access to the American market. Retailing in the U.S. is tightly controlled by American based oil conglomerates headed by Exxon. Much to their chagrin, BP has figured a way to break the stranglehold of its five American sisters in the United States.

BP has bought into Standard Oil of Ohio. SOHIO is, by oil standards, a small company with large debts. It has little in the way of reserves, but its virtue in BP's eyes is its marketing chain in the U.S. So, the two made a deal by which they mutually cover each other's bare flank.

Presently, BP owns 26 per cent of SOHIO. According to the merger agreement BP's ultimate ownership could rise to over 50 per cent, but that is dependent upon BP's throughput of Alaska oil as of January, 1, 1978. "In order to acquire more than 25 per cent of SOHIO's common stock," Mary Clay Berry explains, "BP would have to move at least 200,000 barrels of Alaskan oil through the pipeline every day by January 1, 1978." (123) BP has an enormous incentive to get the pipeline built as quickly as possible regardless of cost.

Exxon, on the other hand, is not anxious to see its competition upgraded which explains why, as a member of Alyeska, Exxon was dragging its feet somewhat in 1973 and 1974. Exxon doesn't really need North Slope crude at this time, having access to sizeable and less expensive reserves elsewhere in the world.

For once, however, what Exxon wants is not the determining factor. Together the BP_SOHIO combination (through their subsidiaries BP Pipeline, Inc., and SOHIO Pipeline Co.) control 49.18 per cent of Alyeska. Exxon owns a mere 20 per cent. (Comptroller General, 12)

.....

In summary, the Alyeska pipeline appears to have become irretrieveably enmeshed in mismanagement, bad planning, incredible waste, and massive cost over-runs for reasons of profit. Quite simply stated, it pays the oil companies to rush the pipeline into operation, regardless of expense, and to inflate costs without exercising restraint. The method of tariff regulation practiced by the Interstate Commerce Commission literally invites the oil companies to inflate costs to increase their overall profits. By basing the transportation tariff on total pipeline costs, inclusive of over-runs, the I.C.C. permits the Alyeska companies to recoup all money spent and make a profit proportional to their total investment. Because profits inflate in tandem with costs, the incentive for the companies shifts from cost control to cost explosion.

CHAPTER II
SYNCRUDE

Syncrude, in all important respects, is a corporate entity similar to Alyeska. It is a cardboard company, a joint venture, organized to exploit one resource. It operates, as Syncrude president Frank Spragins says, on "a glorified expense account, without independent assets or revenues." (Pratt, 118) Syncrude's bills (and eventually its income) are divided amongst the participants according to their percentage holdings.

Originally Syncrude was a consortium of four oil companies: Imperial Oil (owning a 30 per cent share), Cities Service Athabasca Ltd. (owning 30 per cent), Atlantic Richfield Canada (holding 30 per cent) and Gulf Oil Canada (with the remaining 10 per cent interest). All are subsidiaries of American corporations operating in Canada.

In 1971 the Energy Resources Conservation Board gave Syncrude permission to proceed with construction of their proposed 125,000 barrel-a-day oil recovery plant at Mildred Lake in northern Alberta. This followed a decade of study by the consortium and four years of operation at the Great Canadian Oil Sands plant. The price of oil in 1971 was less than $3.00 a barrel. The companies, forecasting that oil prices would climb at the slow rate of 10¢ a barrel a year until 1980, thought their 125,000 barrel-a-day plant would be profitable with an oil price of $3.75 when it came on-stream in the late seventies. Now, of course, the cost of oil sands production is estimated by the Federal government at $14-$16 a barrel before any royalties or income taxes! (Financial Post, March 26/77)

Initially, the tar sands was viewed as a profitable, but nevertheless a marginal, resource to be developed for export. With Alberta floating on a sea of conventional crude available at a cost of a few cents a barrel, oil from the tar sands was comparatively expensive and surplus to Canadian demand. The trouble with oil, back in 1971, was its abundance. Every new resource caused headaches for the industry. Surpluses meant low prices.

Countering the industry's objections to tar sands development with financial incentives and pep-talk the province of Alberta was finally able to persuade Syncrude to go ahead in 1971 after a full decade of extensive research into the feasibility of oil sands recovery. Syncrude's estimate for the cost of the tar sands plant at that time was $500 million.

While the Alberta government was anxious to see development begin immediately the oil companies appeared to be in no hurry, adhering to their own internally established timetable. As long as the apparent oil surplus kept prices low the incentive to get on with "the big, tough, expensive job" of developing the tar sands was small.

Suddenly, in 1973, the oil crisis set the scenario for rapidly rising prices, making the tar sands a highly attractive development according to the industry's own calculations. Surprisingly, rising oil prices did not give the project added impetus, but had the curious effect of stalling development. Whereas, in 1971 a price of less than $4.00 a barrel had been sufficient to initiate the Syncrude proposal, by the mid-1970's the companies concluded that a price of $7.00 was inadequate and the Syncrude must be guaranteed access to world prices before development would proceed.

To justify its claim to world prices the consortium pointed to the rapidly escalating cost of building the recovery plant. Indeed, the cost of Syncrude's project has been subject to enormous inflation, starting at a modest $500 million the total cost now exceeds $2 billion. Coinciding with a four-fold increase in the price of oil has been a four-fold increase in the price of Syncrude. The greatest coincidence of all, however, is that "throughout, Syncrude has consistently produced data on costs which show that the project can at best make a modest return of around ten percent." (Pratt, 167)

Costs Up: Profits Down?

Canadian geologists and engineers have been puzzling over and experimenting with the tar sands for half a century. The pioneering work done by government employees made the Great Canadian Oil Sands project possible.

Recognizing the premium quality of the crude produced from the sands and its value as a feed stock for the petrochemicals industry the province of Alberta has been anxious to develop its most intriguing resource for a long time. Development has been blocked by the lack of a comprehensive national energy policy, the domination of the oil industry by American-owned firms, and the relative abundance of cheap, readily accessible crude in the province.

To back up its claims to the industry that exploitation of the sands would be a profitable undertaking the province of Alberta commissioned a feasibility study in the late 1940's.

*1950. The Blair Report, released in 1950, demonstrated the potential profitability of such a project. With a 20,000 barrel-a-day plant, the report forecast a profit of 40¢ a barrel - a 5.5 per cent return on capital invested. Extraction costs were estimated at $1.53 a barrel; transportation and storage costs at $1.02. Deducted from an estimated market value of $3.50 this left a potential profit of 40¢ a barrel. (Pratt, 189)

More recent reports show the same prospects of profitability without the need for world price levels.

*1971. Syncrude's own decision to go ahead with their project was made in the anticipation that oil prices would rise modestly to $3.80 by 1982. Their original proposal indicated that the consortium was satisfied with the potential profitability of a 125,000 barrel-a-day plant with a selling price of $3.75 a barrel.

*1973. A second Alberta government study, using cost figures supplied by the oil industry, determined that Syncrude would be profitable when it came on-stream in 1978 at a price of $4.85 a barrel and at $7.10 in the mid-1980's. An adjustment for the effects of inflation on construction costs was built in. (Globe and Mail 21.12.74)

*1973. The Federal government's An Energy Policy for Canada estimated that at least 15 billion barrels of crude was recoverable at a price of $5.00 a barrel (this included a profit to the producer) and that 35 billion barrels would be recoverable at a selling price of $6.00 a barrel. These estimates were also based on figures supplied by the oil companies.

*1975. Oil Week reported G.E. Dawson's (of Home Oil) comment that at $5.00 a barrel - that is, $5.00 after royalties and taxes - "we can skim off the cream." At that price

the industry would be prepared to produce 20 billion barrels of crude. At current rates of consumption that would be 20 years supply. At $10 a barrel, 100 billion barrels or 150 years' supply could be produced. At $12 a barrel, 300 billion barrels or 450 years' supply could be produced and at $50 a barrel, 500 billion barrels or 750 years' supply. (Oil Week, 17.2.75)

*January, 1976. S.B. Moro of Shell Canada estimated that $12 a barrel (in constant dollars) would provide a "reasonable return" to the producer and some incentive to go ahead. The $12 price was broken down to $4.65 in operating costs, $2.00 in write-offs, $2.00 for profit at a 6 per cent return, and the remaining $3.35 for the government. (Financial Post, 31.1.76)

*October, 1976. Between 1973 and 1976 Oil Week reported, actual mining costs increased by 67 per cent. The cost of a prototype 125,000 barrel-a-day plant had increased by 300 to 500 per cent. In 1973 a profit of 14 per cent was possible on mining operations at a crude oil price of $6.00 a barrel. At $7.00 a profit of 9 per cent was feasible for in situ operations.

"For a new plant now being built," the article continued, "the indicated crude oil price at start-up is $20 per barrel after some adjustment for continued inflation to the world oil price boost of some $10." Furthermore, the required price of crude which was $7.00 a barrel in 1973 for a Syncrude-type operation is now $25 a barrel. (Oil Week, 11.10.76)

Rapidly escalating capital costs are invariably cited as the reason why assurances of higher and higher crude prices are required. And judging by the experience of Syncrude's cost estimates the need for crude prices "very much higher" than $10 appears to be justified.

According to Syncrude's figures the recovery plant has suffered from an appalling rate of increase in the cost of manpower and equipment which explains their startling 300 per cent cost over-run to date.

1971 - Syncrude's proposal, as approved, was estimated to cost $500 million.

January, 1973 - Estimate increased to $650 million.

March, 1973 - Estimate increased to $750 million.

July, 1973 - Original estimate doubled to $1 billion.

Fall, 1974 - Estimate doubled again to $2 billion.

June, 1975 - Estimate increased to $2.05 billion.

The Deal

With cost increases of the order of 300 per cent it is no wonder the consortium turned to the government for financial aid in 1973 and again in 1975. Syncrude asked first for exemption from royalties in years it operated without profit and for a guaranteed rate of return on its investment.

Meeting with the Alberta government throughout the spring and summer of 1973 a deal was finally agreed to in September. In lieu of a royalty based upon the value of the crude produced, Syncrude and the province of Alberta agreed to a 50-50 profit sharing arrangement. The profit sharing agreement is essential to the deal because it means that in years when no profit is made Syncrude will pay no royalties. Furthermore, in calculating the net profit to be shared with the province, the consortium is entitled to deduct from revenues its operating costs, depreciation, losses carried forward and, most important, eight per cent annually on seventy-five per cent of the consortium's total investment.

The Alberta government also gave Syncrude its assurance that it would move heaven and earth to get the consortium access to world prices for the tar sands oil. Of course, with a 50 per cent share of potential profits the province now has a vested interest in higher oil prices to increase the value of Syncrude's production.

When the deal was renegotiated in 1975 these features remained unchanged. To persuade the companies to proceed after Atlantic Richfield withdrew the three governments came up with an additional $600 million in equity thereby providing the best insurance possible that Alberta, Ontario, and Ottawa would all favour higher oil prices in future.

The Critics

All the indications are that the profit sharing agreement with the Alberta government will perform the same financial miracle for Syncrude as the cost-plus pricing of oil transported via the trans-Alaska pipeline will do for Alyeska. No matter how high the estimates go neither Syncrude nor Alyeska will be stuck for the bill. The cost of both projects will ultimately be borne by consumers both directly as higher prices and indirectly as foregone tax revenues. Indeed, the implications of the profit sharing agreement are that Syncrude, like Alyeska, has no incentive whatsoever to keep costs down, and stands to gain disproportionately as the estimates sky-rocket.

Critics of the deal were quick to point this out. Responding to the profit sharing agreement Dr. Bruce Wilkinson, chairman of the Department of Economics at the University of Alberta, noted that, at worst, Alberta's share would be the equivalent of a royalty of one per cent and that, at best, a royalty of less than seven per cent, - either of which would be the lowest in the world. Wilkinson doubted Premier Lougheed's claim that Syncrude would produce $1 billion for the province over its lifetime. A more likely figure, Professor Wilkinson suggested, would be between $300 and $500 million. Yet Alberta's commitment to provide infrastructure in the Fort McMurray area is expected to cost more than $300 million.

Under a similar profit sharing agreement the Great Canadian Oil Sands plant would have paid no royalties at all between 1967 until 1974, the year it made its first profit. With a conventional royalty based on the value of the oil produced GCOS returned $7.1 million to the province of Alberta in that period and $6 million to Ottawa in sales tax.

A more searching criticism of the deal stressed the conflict of interest within the Syncrude consortium.

The strategy of each of the oil companies is to maximize its profits on a global basis. Syncrude is only one of their many ventures and as such is fitted into the corporation's total profit picture. The incentive to the companies is plainly to maximize their own profits by minimizing those of Syncrude. Being fully integrated operations the companies can transfer much of the profit away from the refining end, detract from Syncrude's net profit while enhancing their own profit performance, and minimize the amount to be shared with the governments.

"Peter Lougheed's profit sharing scheme," warns Larry Pratt, "creates an irresistable incentive for the accounting departments of the owners to keep their costs up and profits down, and there are many tested techniques for them to utilize." (118) Elsewhere he explains that "it is obviously in the interests of the participants to exaggerate their costs and overcharge Syncrude through the use of high management fees, royalty fees, rental payments, licencing arrangements with parent firms, and so on." (134)

As one example of how slick accounting practices can be to the advantage of the oil industry Pratt cites the use of Esso Research and Engineering by Syncrude for its bitumen upgrading and refining technology. As a wholly owned subsidiary of Exxon whatever Esso Research and Engineering receives in licencing fees appears as an expense to Syncrude and reappears as income to Exxon.

The governments have opposite needs. They plainly want a healthy profit to justify the expenditure of public money and the substantial tax concessions made to Syncrude. Furthermore, they want to protect their investment; they do not want to see the value of their stock diminish. But, because the governments have deliberately rendered themselves defenseless in opposing the business practices of the companies they will undoubtedly attempt to salvage their investment by insisting on higher prices to artificially beef-up Syncrude's profit.

As in the Alyeska case there is no incentive for the consortium to minimize costs. The companies have a sure investment, they have been guaranteed an eight per cent return on three-quarters of their capital expenditures. The more they spend the larger the guaranteed dollar profit for the companies and the smaller the government's share. The larger the initial cost, the longer the tax free period. And since the individual companies can deduct their Syncrude losses from income earned in other operations nothing is lost in letting the cost of Syncrude inflate upwards. In fact, with three governments as business partners, escalating costs help the oil companies cement their claim to international crude prices with government acquiescence.

"To say the least," Pratt concludes, "such an arrangement does not exactly encourage profit-making zeal in a company: indeed, it can create precisely an opposite tax incentive for a corporation to transfer profits 'downstream' into other areas of its vertically integrated organization." (128)

The Exaggerated Over-runs

Larry Pratt, in his book, charges that the oil companies' insistance on an oil price "very much higher" than $10 a barrel before it would proceed with Syncrude was "a purely arbitrary demand which appears to be unrelated to real costs." (140) Furthermore, he suggests that following the 1973 deal with the Alberta government the companies "artificially inflated Syncrude's cost estimates in a bid to win additional concessions from government and to take advantage of the profit sharing arrangement." (134)

Most suspicious is the spectacular inflation of Syncrude's estimates in early 1973 just before Alberta began negotiating with the oil companies. The original $500 million estimate was increased to $650 million in January, 1973, revised upwards to $750 million in March, and put up to $1 billion in July.

Very sketchy information was provided by Syncrude to justify these increases. In rationalizing the doubling of the original cost the companies attributed the

additional $500 million to an inadequate design in the original proposal, to escalating costs for heavy equipment and housing, and to environmental problems. Furthermore, a contingency allowance, amounting to about one-quarter of the total increases, was included "to cover unexpected costs including work stoppages, strikes in transportation systems or fabrication plants and other unexpected events." (167)

Alberta accepted these cost figures, apparently without question, in deciding on the terms of the 1973 deal.

Finally, after a second explosion in costs, doubling the estimate once again to $2 billion, and after a second appeal for financial aid from the consortium, the province of Alberta commissioned four audits of Syncrude's cost estimate. Since three of the four firms hired to check Syncrude's books were closely associated with the oil industry and all four were competitors of Bechtel (Syncrude's prime contractor) "there were gasps in engineering circles" the Engineering Journal reported. "Nevertheless," they continued, "both sides appear to have behaved with courtesy and consideration..." (Eng. J.March/April, 1975). That is, perhaps, why we are still in the dark about Syncrude's cost spiral.

The review of Canadian Bechtel's estimates and the adjustment made to those estimates by Syncrude were, in the Engineering Journal's words, "professionally competent, reliable, and accurate to within acceptable limits."

Although, the report concluded: "No evidence has been found to suggest the July 1973 appropriation estimate was improperly understated or...that the December 1974 estimate has been unduly inflated" the auditors did not find the two estimates completely compatible. They said: "The July 1973 Appropriation of $960,000,000 has been reviewed in the light of the SCL (Syncrude Canada Ltd.) Dec. 1974 estimate of $2,282,000. Although it is not possible to completely reconcile the two estimates, it can be shown there are justifiable reasons for the increase in cost." The report then cites three causes:
"(i) severe and unanticipated escalation, (ii) additional pre-production costs due to increases in length of the project and manpower requirements, (iii) estimate growth as the engineering definition of the project advances." (Engineering Journal, March/April, 1975)

Just before the audit was commissioned Mel Hurtig, a vocal critic of Alberta's 1973 deal with Syncrude, discussed Syncrude's cost over-runs with "two dozen knowledgeable industry veterans" including a former Syncrude employee. He reported his findings in an article in the Globe and Mail:

"What they had to say is so different from what you've been reading in the papers, it's almost impossible to comprehend how the industry's distorted gloom and doom campaign can have been so readily accepted.

"In a nutshell, the consensus is this:
There's no way a 125,000 barrels-a-day tar sands plant is going to cost $2 billion... Petrochemical construction in Alberta has indeed shown large inflationary overruns - in the neighbourhood of 20 per cent annually. Possibly a plant which was supposed to cost as much as $700 million in 1972 could run to $1 billion in 1974-75, but 'nowhere near twice that amount'. Anything much over $1 billion could only be 'a colossal boondoggle or just plain damn bad management."

THE MACKENZIE VALLEY PIPELINE

Serious doubts have been raised about the feasibility of a Mackenzie Valley pipeline. Critics do not believe that a pipeline can be built by 1982 nor can it be built for less than $9 billion as Canadian Arctic Gas claims. The controversy centres around two essential questions. First, is it possible, given the engineering and environmental problems, to build the pipeline on schedule and within the proposed budget? Secondly, can the consortium manage the project efficiently, is it willing and able to exercise cost control?

For many observers, the demand for government backstopping and other guarantees have only increased their doubts. Some say flatly that there is no hope of completing the pipeline within Arctic Gas' timetable and by trying to do so the already substantial cost over-run will be further increased. Similarly, Arctic Gas' budget is viewed with suspicion. After watching the price of the trans-Alaska pipeline double during the construction phase no one believes a Mackenzie Valley pipeline can be brought in on cost.

A more important criticism of the project concerns the relationship between cost over-runs and the price of energy. For all intents and purposes Canadian Arctic Gas may as well be Alyeska or Syncrude. It is a single venture consortium operating in a power vacuum, without assets, without revenues, and, one might add, without experience at building arctic pipelines. When the project is completed CAGPL will merely transport the gas for its owners.

At virtually no financial risk to themselves, members of the Canadian Arctic Gas consortium will profit once from the transportation of the gas and twice from its sale. The same fundamentally perverse relationship between construction costs and energy pricing which exists in both the Alyeska and Syncrude projects is true of the Mackenzie Valley pipeline. Whatever the ultimate cost, however sloppy the management, however gross the cost over-run, the tariff set for the use of the pipeline will cover it all, and guarantee a profit to the pipeline's backers. The consumer will foot the bill not the oil industry.

Again, as with the other two projects, because the profit generated by the pipeline tariff is a percentage profit based on construction and operating costs, the

bigger the cost over-run, the greater the waste in its construction, the higher the companies' dollar profits.

While critics have vented their spleen primarily on the CAGPL proposal, (because it is the biggest, the most ambitious, and the most expensive) what is true for one Mackenzie Valley pipeline is true for them all. While smaller, less ambitious projects may have virtues in other respects, for purposes of cost over-runs one proposal may as well be any other, the only possible difference being the extent and size of the over-run.

Unless the pipeline is built without financial guarantees protecting the investors and until the relationship between the eventual tariff, cost over-runs, and corporate profits is changed, a project of this size, built by this industry will always be subject to pressures to enormously inflate construction costs.

Can They Do It Or Can't They

Critics do not believe that the pipeline can be built on schedule for the amount of money proposed. They made the same criticism when Arctic Gas made its first proposal to build the pipeline at a cost of less than $6 billion. Today the cost is $9 billion and still rising.

The construction problems posed by an arctic pipeline complicate an already tight construction schedule. Difficult terrain, sections of discontinuous permafrost, extreme weather conditions, and the lack of support facilities together introduce a high degree of uncertainty about the eventual completion date. Taking into consideration the enormous cost escalation of the Alaskan pipeline resulting from the consortium's desire to meet its start-up date it would appear that for such a large-scale undertaking delays are unavoidable and that attempting to work to a tight schedule inevitably means cost over-runs.

Arlon Tussing, based on a review of other large capital projects in the United States,assumes that the Mackenzie Valley pipeline will ultimately cost over $20 billion. Large-scale construction projects normally come in at two or three times

their original cost estimates even though the estimators include an adjustment for inflation. The estimators do not, however, take into account "the fact that huge projects, particularly if they involve new technology or a remote construction site, usually don't work the first time around." Complications continually arise. The builder and the licencing agency often change their minds about design during the planning and construction stages necessitating redesign and causing delays. "Such projects," Tussing believes, "are usually clumsily managed..., materials and equipment are always late and often mis-specified or defective, and....wage rates suffer from abnormal inflation."

In the Arctic Gas case the consortium's proposal combines an unfamiliar and hostile environment for construction, new and untested technology, and a large scale. These are, he concludes, "exactly the ingredients of the most spectacular cost overruns." (CARC Newsletter, Vol. 4, No. 4, 1976)

New Technology

*Arctic Gas plans to use equipment and construction procedures which have never been tried in North Amertca. Its much hailed Super Ditcher has yet to be proven in practice and may cause unanticipated environmental damage. (CARC Newsletter)

*Arctic Gas plans to work during the winter months even though contractors in Alaska abandonned winter work. Abysmally low labour productivity and excessive equipment fatigue during the extreme cold weather sent costs soaring. The time gained simply did not justify the substantial increase in costs involved.

In assessing the construction experience of Price-Potashnick-Codell-Oman on the trans-Alaska pipeline a company representative reported:

> "Extreme cold temperatures can have a bad effect on both personnel and equipment. We have found that -35^{0} F is the lowest temperature at which we can effectively work on equipment-intensive operations. The limit is -20^{0} F on labour-intensive efforts.
>
> ....

"At -20° F, labour productivity is 25% of that obtained in the summer months. At -35°F, all a person can think of is trying to stay warm...Labour productivity at these lower temperatures is next to zero.

....

"We cannot make below-ground tie-ins or, for that matter, backfill the line, at temperatures below +10° F." (Oil & Gas J, 23.2.76)

Low temperatures greatly increase the amount of work required to maintain equipment and engines. The failure rate of steel parts increases due to loss of ductility in the extreme cold. Furthermore, there are residual effects from the cold which do not become apparent until the weather warms. Just as the opportunity to increase the pace of work arrives "suddenly your equipment failures mushroom." (Oil & Gas J, 23.2.76)

*Foothills vice-president, Ed Mirosh, criticized the CAGPL proposal for its use of untested construction techniques. The problem with innovations, he said, is that items not previously manufactured "must be considered as prototypes and will require significant periods of debugging and field trials before they could be used reliably..." Foothills, on the other hand, plans to use only tested materials and proven design. (Oil Week, 17.1.77)

*In a critique of the Arctic Gas proposal commissioned by the El Paso consortium, Green Construction reported that the kind of snow roads and snow work pads which Arctic Gas intends to employ "have not been used previously to support actual construction activities." Because they cannot be built prior to freeze-up or used after the spring, unpredictable weather conditions could delay completion of the pipeline.

Difficult Terrain

*Proof of the difficult arctic terrain is hardly required. Very few contractors have construction experience north of 60° and fewer still have built roads and air strips on the permafrost. Certainly none of the Arctic Gas consortium members has had any experience building pipelines in the far north.

*Until quite recently the consortium did not even realize that it would encounter problems as a result of frost heave. Only after considerable expert testimony was presented exposing this engineering design deficiency did CAGPL respond. Their revised February, 1977 cost estimate showed an extra $124 million for design changes required to compensate for potential frost heave..

*Not only will labour productivity be drastically reduced during winter construction, but according to Green Construction the amount of manpower needed to attain the rate of construction desired is substantially more than has been budgeted for by Arctic Gas. From their experience on the Alyeska line Green Construction estimates that 55-man crews will be required to drill and blast the necessary length of trench as opposed to the Arctic Gas estimate of 10-man crews. And, they point out, Green's rate of progress "was achieved in the summer in moderate temperatures while Arctic Gas plans winter construction." (Green Report, Summary, (v))

Large Scale

*There can also be no question of the enormous scale of the undertaking. The only question is whether it is too big. The amount of capital required to build the pipeline dwarfs previous stock issues. "To my knowledge," says Myron Gordon, "the $1.2 billion required to provide 20 percent of the capital is...the largest new stock issue ever floated anywhere in the world." (CARC Conference, 19) The amount of debt to be issued will exceed all of Bell Canada's outstanding debt.

*The size of the pipeline has been compared to the Canadian Pacific Railway - a project infamous in Canadian history for its gigantic profit to a very few men at public expense - by the Prime Minister. In his words:

> "It is expensive, but so was the Canadian Pacific Railway a century ago. Is it too big a project for Canada? Only in the view of those who have lost faith in what Canada is all about." (Last Post, March, 1973)

Experience with other projects facing construction problems similar to those posed by a Mackenzie Valley pipeline have repeatedly come in far over cost. "Actual construction costs," Arlon Tussing predicts, "may exceed estimated costs by substantially

more than the effect of general inflation. The Arctic Gas project involves construction and operating technology untested in North America, while its route traverses hundreds of miles of difficult terrain where there has been no previous construction of either pipelines or roads...New technology, unfamiliar environments, and a large scale - relative to previous projects - are exactly the ingredients of the most spectacular cost overruns...I would not be surprised to see the total cost.... exceed $20 billion, including interest on funds used during construction." (CARC Newsletter, Vol. 4, No. 4, 1976)

Unrealistic Assumptions

In revising its cost estimates both Canadian Arctic Gas and Foothills have consistently attributed the rapid escalation to inflation and delays. CAGPL in November, 1974, for example, cited an increase in the cost of pipe of 30 per cent, rising prices for other materials, plus a further year's delay as the reasons for a $1.3 billion increase to a total cost of $7 billion.

Very few observers really believe anymore that the pipeline can be built without significant cost over-runs. Having seen the cost of the Alyeska pipeline inflate ten times over, the cost of the James Bay Hydro-Electric development increase to $16 billion, and the cost of the Olympics sky-rocket the Globe and Mail wondered last December "whether the proposed Canada-U.S. Mackenzie River Valley gas pipeline project might not be a repeat of the Olympic Games in Montreal, in terms of cost escalations." (G&M, 31.12.76)

Having experienced considerable cost escalations because of inflation over the past four years it would be expected that current cost estimates would include a generous margin in anticipation of future cost increases for labour and materials. Not so, however. The August, 1976 revised estimates of Arctic Gas incorporated a factor for 3-5 per cent increase in equipment and materials costs and an 8-10 per cent increase in wages. (Similarly, Foothills adjusted their estimates upwards and included 6 per cent for equipment and 8 per cent for wages).

With respect to the size of the pipeline project these inflationary factors seem unrealistic. Wages, in particular, will undoubtedly be subject to more than average

inflation because of demand pressure, the isolated work area, and tight unionization of the work force.

In assessing the likelihood of CAGPL staying within its estimate the Globe and Mail reported:

> "Mr. Horte noted that even the $8 billion figure for the Canadian portion assumes that inflation will decline to almost nil towards the end of the project - possibly a faint hope." (Globe and Mail, 3.12.75)

The Green Report was also extremely critical of CAGPL's unrealistic projections for manpower, equipment, and, the time required to complete the job. Green predicts a cost over-run of the order of 40 per cent and considers it unlikely that the pipeline can be finished on time. To support this conclusion Green evaluated manpower and equipment requirements for various jobs during the construction phase.

*For drilling and blasting trenches Green estimates that 55-man crews will be required to achieve the rate of progress the schedule demands. Arctic Gas has allowed for only 10-man crews.

*Green estimates that 200 welders per spread will be needed, twice as many as projected by Arctic Gas. In addition, Green believes two welder's helpers for every welder is the proper ratio adding 188 welder's helpers to the manpower requirements for each spread.

*After reviewing six key support jobs Green concluded that Arctic Gas allocated "only 27 personnel in each spread." Support functions analysed included maintainance and repair of heavy equipment and warehousing of spare parts and supplies.

* The overall effect of increasing the manpower requirements to meet Arctic Gas' needs would enlarge the work camps from an estimated 800 individuals to at least 1200. "This situation, while adding substantial costs, will further complicate the problems of camp movement."

*In a similar devastating appraisal of Arctic Gas' plans for moving the work camps

Green Construction reports that a sizeable majority of the proposed moves will entail scheduling problems and that an estimated 11,706 man-days of work lost for each of the 36 moves had not been built into the work schedule. As a consequence, "Arctic Gas has grossly underestimated the time and manpower required to accomplish these moves."

*The consortium's air support proposal is also defective. Arctic Gas has prepared the estimate assuming that one ton of freight is required to support 300 man-days of activity. Green claims this is only 1/23 of what will be required increasing the number of flights per day from one for every 725 people to between 7 and 37. "The result is that Arctic Gas has underestimated the cost of its air support by 1,000%".

*And finally, Green predicts that the construction of fuel supply facilities will cost more than four times what Arctic Gas says it will, that is $34.1 million for the Canadian portion of the line instead of $7.8 million.

Green's total assessment of the Canadian Arctic Gas proposal is that construction plans "are not adequately developed" resulting "in an underestimate of the labour, equipment and materials required to accomplish these jobs, as well as an under estimate of the time required to complete such jobs."

In drawing out the implications of these problems, how the budget and the timetable will be affected, Green reports:

> "Certain problems in schedule, costs, facilities, equipment and manpower have been identified in each of these areas. When these problems are considered together, it appears that, in many cases, they are interdependent and will significantly impact an already very tight construction schedule. Furthermore, while some of these problems may be ameliorated by a significant increase in expenditures, a high probability of a schedule slippage of 1.5 to 2 years still remains."

As this contract was completed independent analysis for the Federal government has, with greater precision and sophistication, generally supported the conclusions of the critics - that a Mackenzie Valley Pipeline will probably go over budget (Fedco).

Cost estimate and overrun projections for one, two, and three year project slippages are included overleaf on a table from the Fedco report.

The Financial Critics

The financial community, generally enthusiastic backers of resource development, appear to have reservations about the viability of the Arctic Gas pipeline proposal. The reasons behind these doubts are not difficult to understand.

*Arlon Tussing thinks that gas production from the Delta "may be substantially less than the design capacity...meaning that each unit actually carried would have to bear a larger portion of the system's fixed costs". Since the amount of gas required to keep the pipeline operating at capacity for 20 or 25 years has not yet been discovered there is a chance that surplus capacity will force the transportation cost per thousand cubic feet even higher than that projected by CAGPL. (CARC Newsletter)

*Back in 1974 when the pipeline was expected to cost less than $6 billion Myron Gordon of the University of Toronto Faculty of Management Studies wondered whether investors would consider pipeline stock as safe an investment as Bell Canada or Inco. "Will the insurance companies, pension funds, banks, other financial institutions and wealthy individuals of Canada, the U.S. and other world capital markets required to absorb the $4.8 billion in debt, believe that the combined probabilities of all the contingencies raised above is practically zero? Are they practically certain that the gas is there, that the pipeline will be built and operated as planned, and that the market is there: in my judgement, the answer is no, and some alternative form of financing is required." (CARC book, p.17)

*At that time Gordon thought a 25 per cent cost over-run would effectively scuttle the project. Since then the estimated cost has increased by 50 per cent and further over-runs are inevitable.

*Responding to a question in the House of Commons Energy Minister Alastair Gillespie said: "Quite clearly, with respect to the Alyeska oil pipeline there were enormous

over-runs, so much so that the financial viability of the project down Mackenzie, if the same were to occur, would be in great doubt." (House of Commons Debates, February 16, 1977)

*Even the oil companies have become hesitant about proposing more pipelines. In fact, they don't even want to be responsible for financing this one. Jeff Carruthers of the Globe and Mail reported last November: "In view of the cost overruns associated with the Alyeska oil pipeline just being completed, none of the major petroleum producers is willing to back another northern pipeline." (G&M 23.11.76)

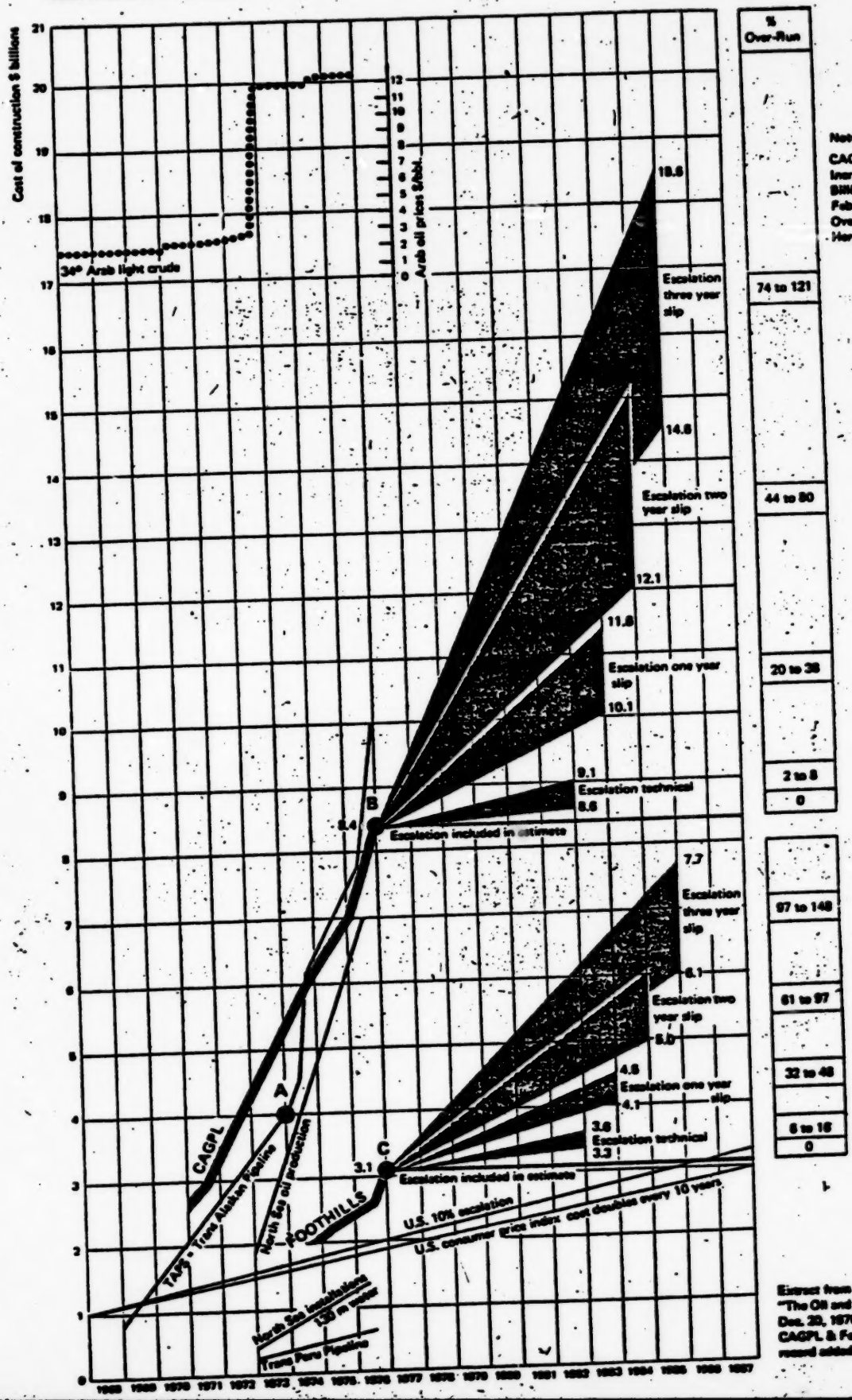
To resolve its financial difficulties the Arctic Gas consortium has called for government aid. The industry wants to pass the risk associated with building the pipeline, including all cost over-runs, on to the public while the oil companies keep the profits. Specifically, CAGPL wants two sorts of guarantees from the federal government: (1) a guarantee that no matter what the ultimate cost the pipeline will be completed and able to pay off its debt, and (2) insurance to cover any interruption in service so that shippers will be able to meet their tariff obligations. In addition the consortium also demands an all-events tariff which acts as a profit guarantee.

Indeed, in the absence of these guarantees, the consortium is not willing to proceed. Before the National Energy Board last December the chairman of CAGPL affirmed the consortium's intentions:

Q: "It is true, is it not, that government backstopping for non-completion is implicit in your financing plan?
Wilder: Yes, it is.
Q: And without it, there is no project?
Wilder: That is correct."

*Such government guarantees of backstopping and interruption insurance would mean that private lenders are simply not willing to invest in the pipeline under present

Cost Estimate Projections



Note:
CAGPL Figure Increased $0.5 Billion By Feb. 1977 Submission Over Those Charted Here.

Extract from "The Oil and Gas Journal" Dec. 20, 1976, with CAGPL & Foothills record added

circumstances. As Myron Gordon says: "If a government guaratee of the debt is raised for consideration, it will be because the investment banking community and the consortium companies find the risks associated with private financing and guarantees unacceptable." (CARC book, 19) Concomitantly, the prospect of government guarantees implies that the private sector thinks there are more profitable ways to invest its money given the degree of uncertainty involved.

Surely there are better ways to invest public funds than to assume responsibility for a project the investment community finds too risky.

IMPLICATIONS FOR THE COST OF ENERGY

When the Mackenzie Valley pipeline was first proposed it appeared to be an economical way of bringing northern Canadian gas to market in conjunction with Alaskan gas. In 1972 contracts to sell Delta gas were signed at 32¢ per mcf. Since then the costs of producing and marketing the gas have increased substantially.

In 1974, even after the price of energy had started its upwards climb, the Mackenzie Valley proposal still seemed economical. Myron Gordon judged it "very likely that the $1.25 per mcf or more that is needed to cover the cost of the gas and operations, depreciation, and a fair return on capital, will be a competitive price when the gas goes on stream and for 25 years thereafter." (CARC book, 17)

While gas still sells at a premium with respect to oil the federal government has announced its intention to allow the price of natural gas to rise to parity with oil. Furthermore, the government intends to move the price of Canadian oil up to international prices within the decade. At an oil price of $18.00 a barrel an equivalent natural gas price would be $3.15 per mcf. Including the $2.00/bbl. transportation cost to Toronto the equivalent city-gate price for natural gas would be $3.50 per thousand cubic feet.

In assessing the probable impact of the Mackenzie Valley pipeline on energy costs it is a real possibility that gas prices will lead oil prices. The CAGPL tariff for transporting Delta gas to its junction with the TransCanada pipeline is approximately $1.00/mcf based on a $7 billion investment. Add to that the 79¢ for transportation through to Toronto and the $1.50 the oil companies say they will require to produce and process the gas. In total this is a delivered price of $3.29 per mcf in Toronto. Of course, this does not assume any cost over-runs during the pipeline construction. (Cdn. Wildlife, Update)

Already the cost of the pipeline is $9 billion increasing the cost of transporting the gas from the Delta to the transCanada pipeline to $1.30 and a Toronto city-gate price of around $3.60 - more than the equivalent of the international price for oil.

If the cost of the pipeline does reach $20 billion, as Arlon Tussing believes it may, transportation costs would exceed $3.00. It is Tussing's opinion that "the cost of delivering the gas might actually exceed its value to consumers."

Thus there is the strong possibility that Canadians will be paying the highest energy prices in the world. Once the Mackenzie Valley project is underway we are irretrievably locked into a long range policy ofhigh prices, particularly if the federal government provides the financial guarantees the industry is insisting upon. Having a financial stake in the operation of the pipeline the government would willingly protect the market for arctic gas by imposing a tariff on imported oil. This would, of course, have serious implications for the cost of living in Canada, real wages, and manufacturing costs. At a time when the federal government professes itself to be primarily concerned with the rate of inflation and Canada's foreign competitiveness, particularly in manufactured goods, it has deliberately chosen an energy policy which runs counter to its other objectives.

The negative impact on consumers will vary. First the percentage of income spent on energy will increase dramatically - as Dr. Kates of the Science Council notes, "By the 1990's energy unit costs will probably be 2-3 times as high as they are today. This factor, combined with a per-capita energy consumption 50% to 100% higher than now, would mean that energy costs could require from 2-4 times today's proportion of personal income". (Science Council Annual Report, p.34, 75-76)

For consumers this will probably mean two responses - conservation by desperation, and less income for the purchase of other needed goods/services. Poor people, who cannot afford more insulation or more energy efficient appliances, will be especially hurt.

Second the capital requirements of this kind of development will deprive other economic sectors of development. As the Federal government Energy Strategy report notes: "(under the higher-priced scenario) This average annual increase in energy-related expenditure relative to historical requirements would be roughly equivalent to about 50% of total 1975 investment in residential construction, 30% of total 1975 consumer expenditure on durable goods, or 17% of total 1975 expenditure on business

fixed investment." And this is according to an estimated $180 billion energy project expenditure ($1975) between now and 1990. An estimate which has not accounted for the cost over-run phenomenon.

As a larger and larger percentage of GNP is absorbed by the energy sector less investment capital will be available for housing, public services, and small business. Consumers will be very strained to purchase housing, to support mass transit, to finance the purchase of large capital goods. Once again the poor will suffer most.

One particular economic sector which will especially suffer from the development of Frontier resources is the fledgling renewable energy industry. While many studies now demonstrate the cost-competitiveness of Model T solar space and water heating (e.g. Hollands/Orgill - National Research Council - 1977) due to various institutional barriers and cultural "bias" solar energy is still conventionally treated as an "exotic" resource whose full development is post 2000 A.D.

What many decision makers do not realize is that every new home heated by gas and oil, every dollar into frontier resources, every scientist and construction worker travelling north, means that much less commitment to the future of solar energy. There is a logistical competition between the two energy paths that is presently biased in favour of frontier resources.

More particularly continued capital-intensive frontier development will probably mean higher interest costs for the capitalization of small solar businesses, and indeed the perception of renewed abundance of oil/gas resources that frontier development will stimulate could mean that few financial institutions will see a future in the renewable energy options - result low or zero funding. Certainly political and other decision makers will find their efforts and energies concentrated on the issues and problems of frontier development. In such a political climate solar initiatives will be stunted.

Furthermore as oil and gas advance their market share Canadian dependence on further frontier supplies of oil and gas will be strengthened. Under this strategy the economics of conversion to solar of a larger and larger population of energy uses biases the society towards a continuation of the frontier pathway. But we all know the frontier pathway is finite and the longer we wait for solar conversion the more costly, disruptive and difficult is that inevitable conversion.

Instead of pushing an unwanted pipeline down the Mackenzie Valley the federal government should be asking itself hard questions about how much Canada can afford to spend pursuing a policy of energy self-sufficiency. The estimated $180 billion (cited by An Energy Strategy for Canada) that we will spend on energy development between now and 1990 is most certainly an underestimate. The profit motive behind inflated costs and burgeoning over-runs indicates that the true cost of this policy will be substantially greater than $180 billion. It may well be that Canadians would be better served in the long run by an energy strategy directed at conservation and the development of renewable energy sources, for as Larry Pratt points out in his book, "it still costs well above a million dollars to create one permanent job in a plant like Syncrude compared to a figure between $50,000 and $70,000 in manufacturing." (Pratt p.111) Pipelines create even fewer jobs than Syncrude-type developments for every billion dollars invested.

Canada is overly dependent upon resource exploitation. Our economic woes will only be exacerbated by a continued emphasis on the development of extractive industries to the neglect of secondary industries. Recently we have reached new heights in unemployment, our industrial base continues to decline, and we face a steadily worsening balance of trade for manufactured goods. In these circumstances our scarce investment funds could be more effectively used to promote long term economic growth and provide jobs if applied to the manufacturing sector rather than to development of marginal fuels.

Irrespective of arguments to the contrary, if we continue on the road to high energy prices by developing our frontier and non-conventional sources, Canadians should at the very least be assured that these projects will be built with efficiency, without waste, and on cost. We need protection from inordinately high energy prices which may, in fact, exceed world prices. All new sources of oil, gas, and electricity must be priced in accordance with initial cost estimates, thus forcing the oil companies to take financial responsibility for cost over-runs. To do less would burden Canadians with energy which far exceeds its true value.

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